Corrugated Two-dimensional Material Enabled Flexoelectricity for Cryogenic Actuator Technology

Completed Technology Project (2016 - 2020)

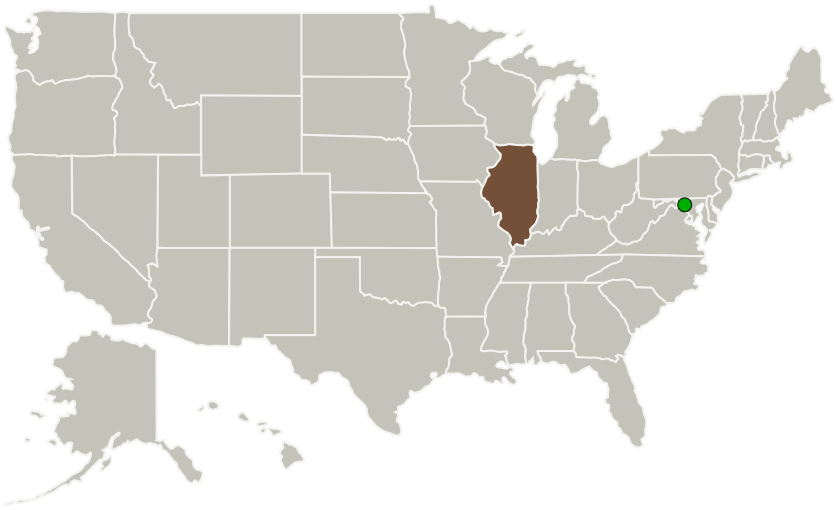
Project Introduction

Next generation cryogenic actuator technology (CAT) calls for a wide range of operating temperatures from -296 °C (liquid He) to 116 °C (max on moon surface). Achieving such a wide range is challenging for conventional piezoelectric actuators as at low temperatures, piezoelectric coefficient will drastically decay and at high temperatures (near the Curie temperature), the devices will be depolarized and completely inoperable. These performance degradations are especially problematic for conventional polycrystalline piezoelectric materials. The objective of this proposal is to advance NASA's CAT capability by creating a novel actuator based on the converse flexoelectric behavior of corrugated molybdenum disulphide (MoS2) thin films. The flexoelectric CAT (FCAT) will enable improvements to performance, reliability, and lower mass/volume for next generation CAT applications.

Anticipated Benefits

The flexoelectric cryogenic actuator technology (CAT) will enable improvements to performance, reliability, and lower mass/volume for next generation CAT applications.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
University of Illinois at Urbana-Champaign	Lead Organization	Academia	Urbana, Illinois
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Illinois

Project Website:

https://www.nasa.gov/strg#.VQb6T0jJzyE

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

University of Illinois at Urbana-Champaign

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

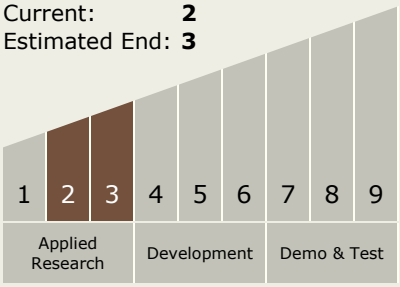
Hung D Nguyen

Principal Investigator:

Sungwoo Nam

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.7 Mechanism Life Extension Systems

Target Destinations

The Moon, Mars, Earth